

June 16, 1925.

1,542,804

W. H. GRAY

BOWLING ALLEY SYSTEM

Original Filed Aug. 12, 1921

6 Sheets-Sheet 1

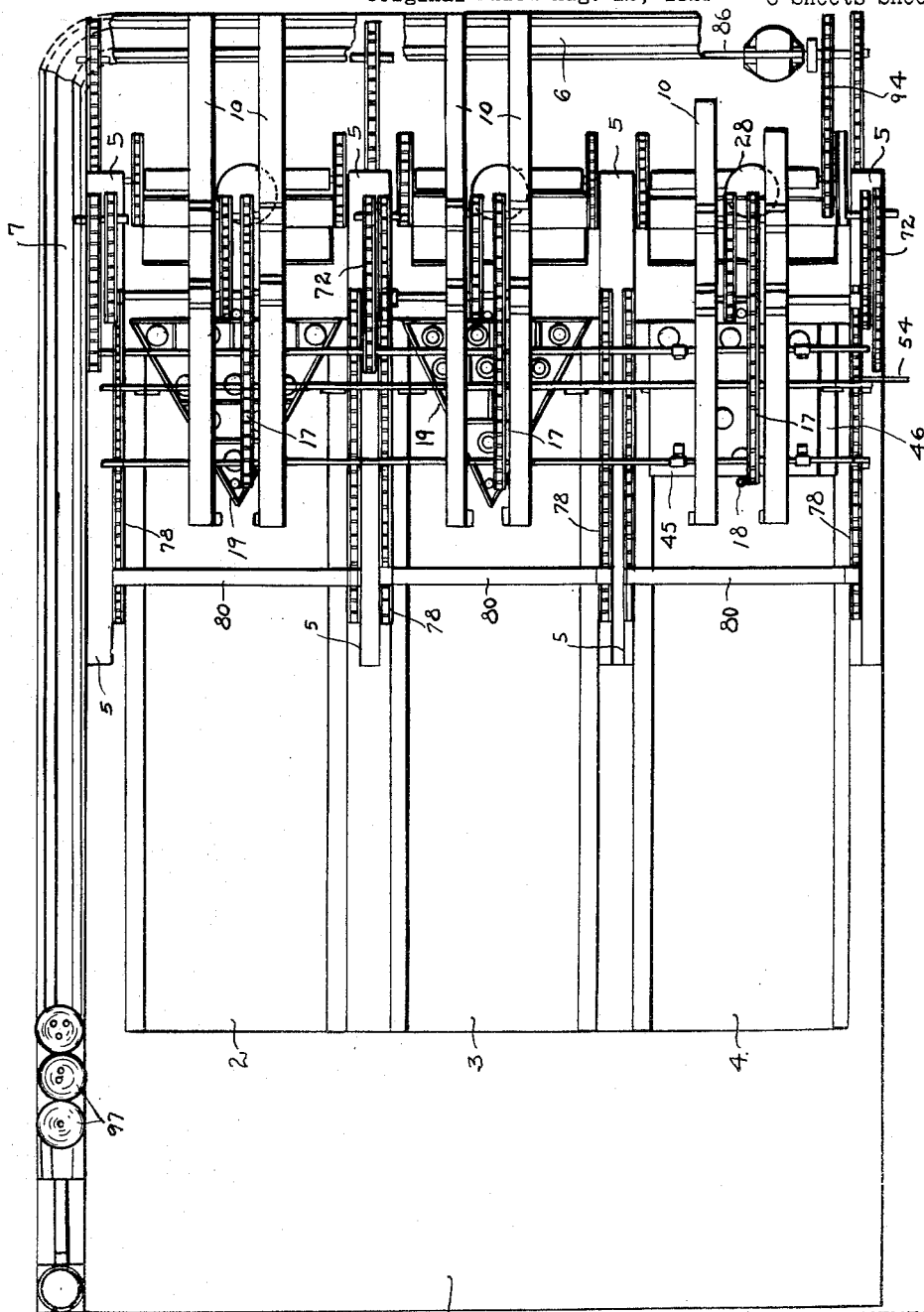


Fig. 1

INVENTOR.

Walter H. Gray,
BY Walter N. Haskell,
his ATTORNEY.

June 16, 1925.

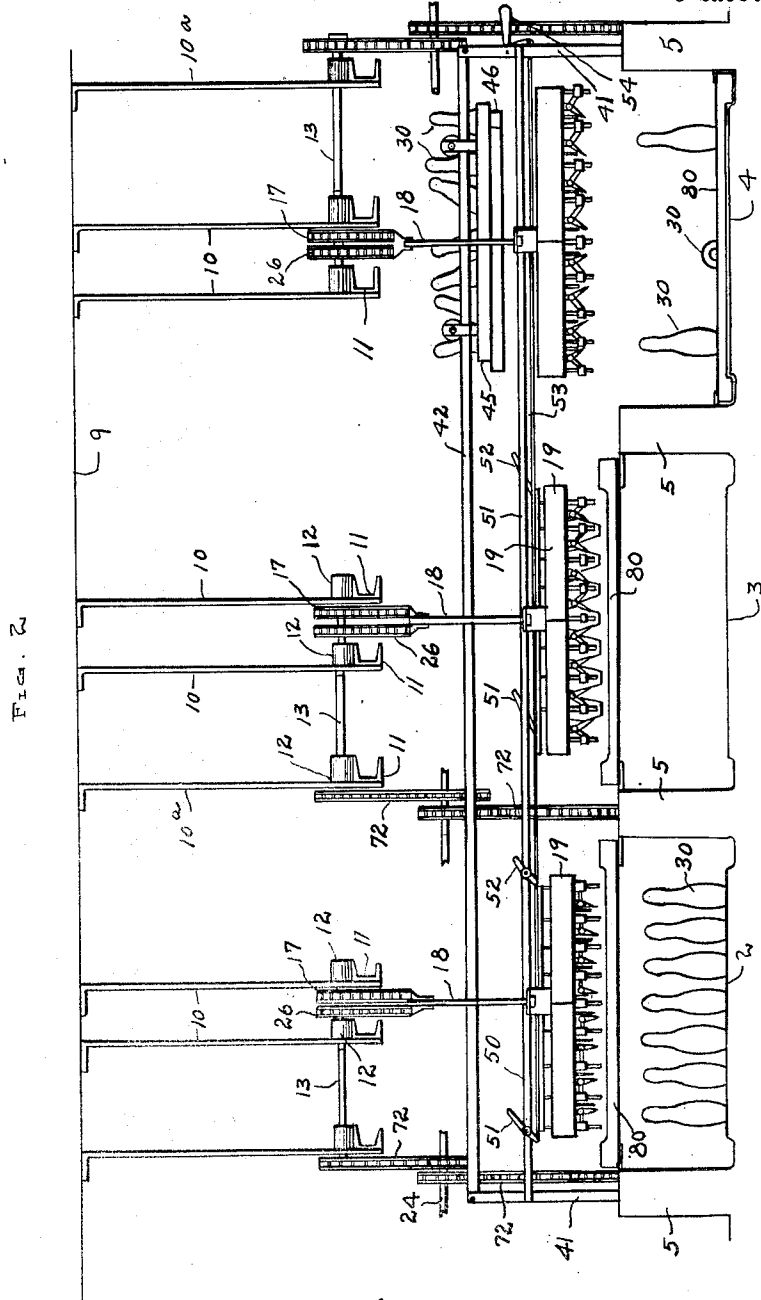
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6 Sheets-Sheet 2



INVENTOR.
Walter H. Gray,
 BY *Walter N. Haskell,*
 his ATTORNEY

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6 Sheets-Sheet 3

FIG. 3

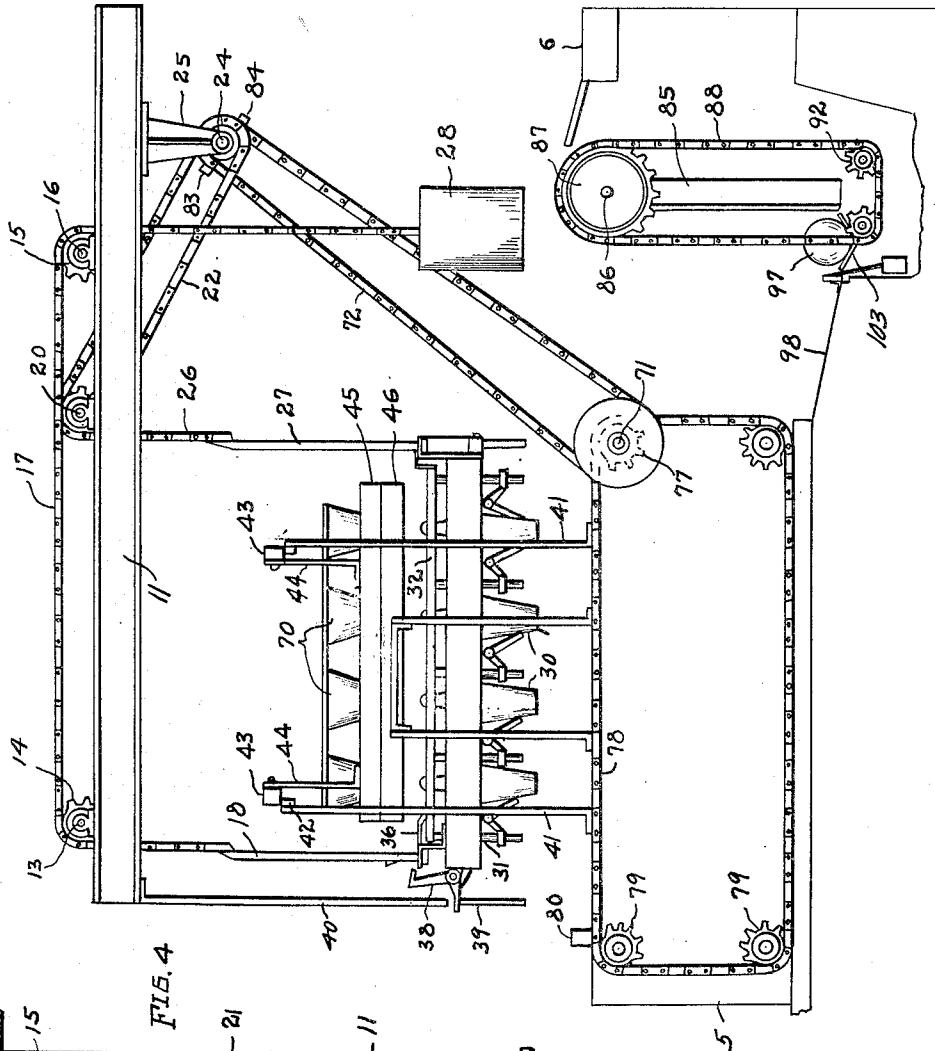
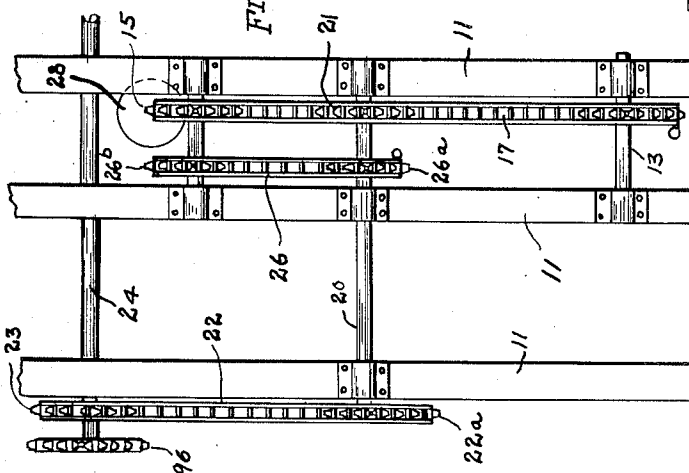


FIG. 4



INVENTOR.
Walter H. Gray,
BY Walter N. Haskell.
his ATTORNEY.

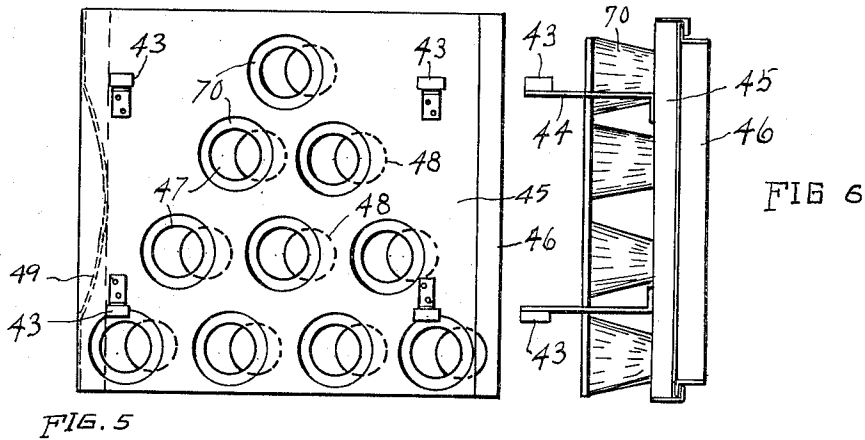
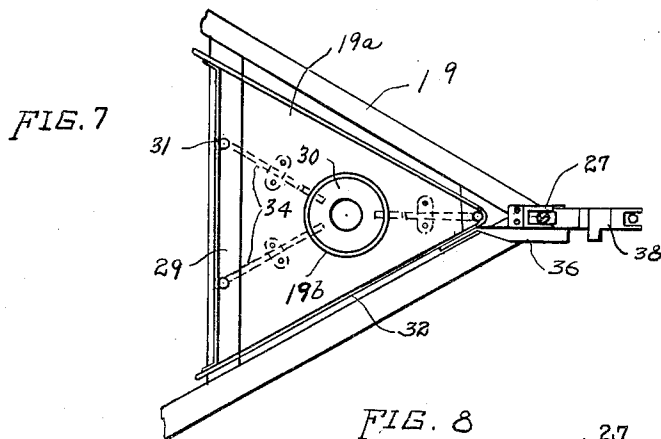
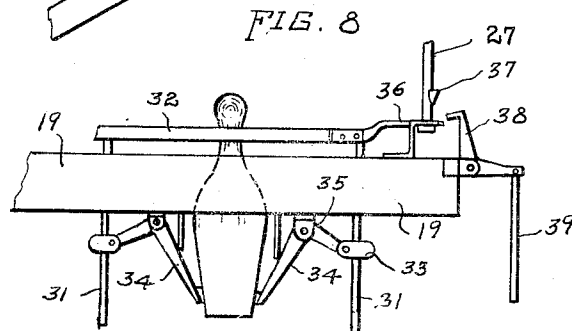
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W. H. GRAY

BOWLING ALLEY SYSTEM

Original Filed Aug. 12, 1921, 6 Sheets-Sheet 4



Walter H. Gray, INVENTOR.
BY Walter N. Haskell,
his ATTORNEY

June 16, 1925.

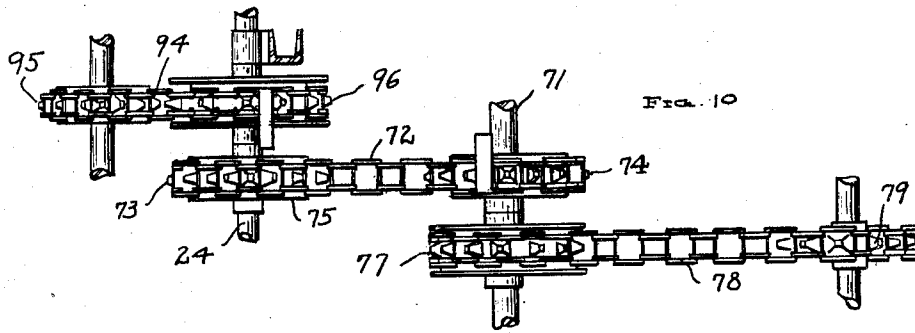
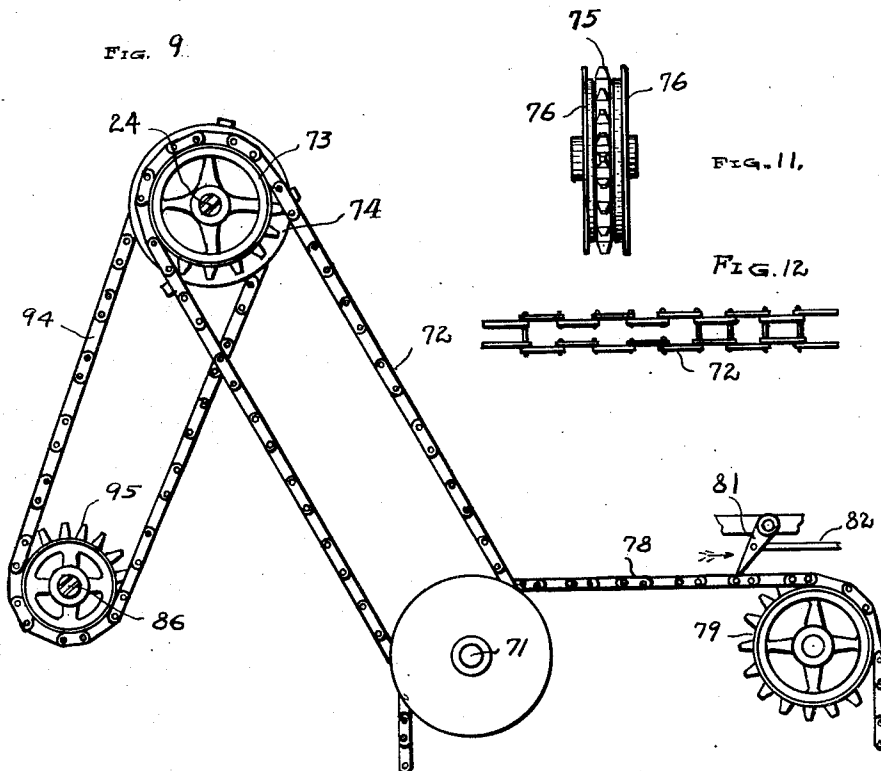
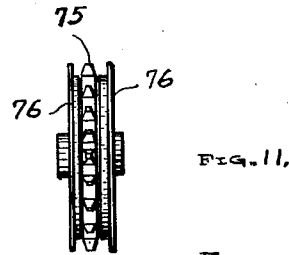
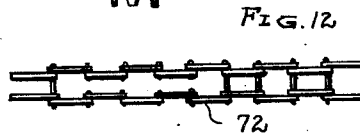
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W. H. GRAY

BOWLING ALLEY SYSTEM

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6 Sheets-Sheet 5



INVENTOR.
Walter H. Gray,
BY Walter N. Haskell,
his ATTORNEY

June 16, 1925.

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W. H. GRAY

BOWLING ALLEY SYSTEM

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6 Sheets-Sheet 6

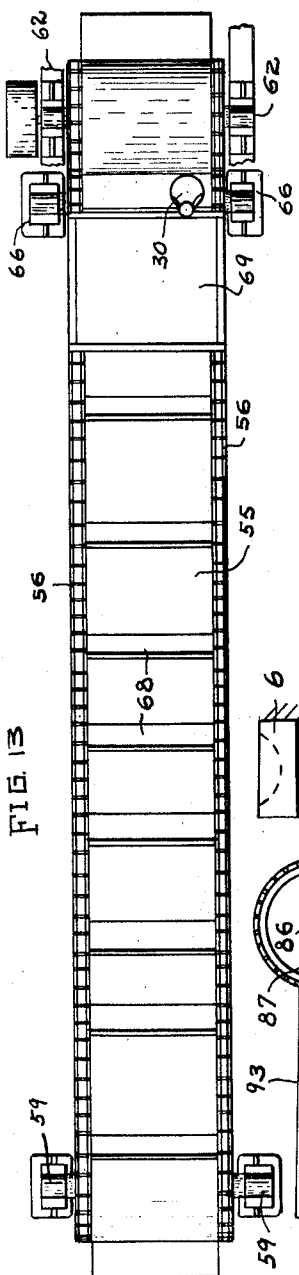


FIG. 13

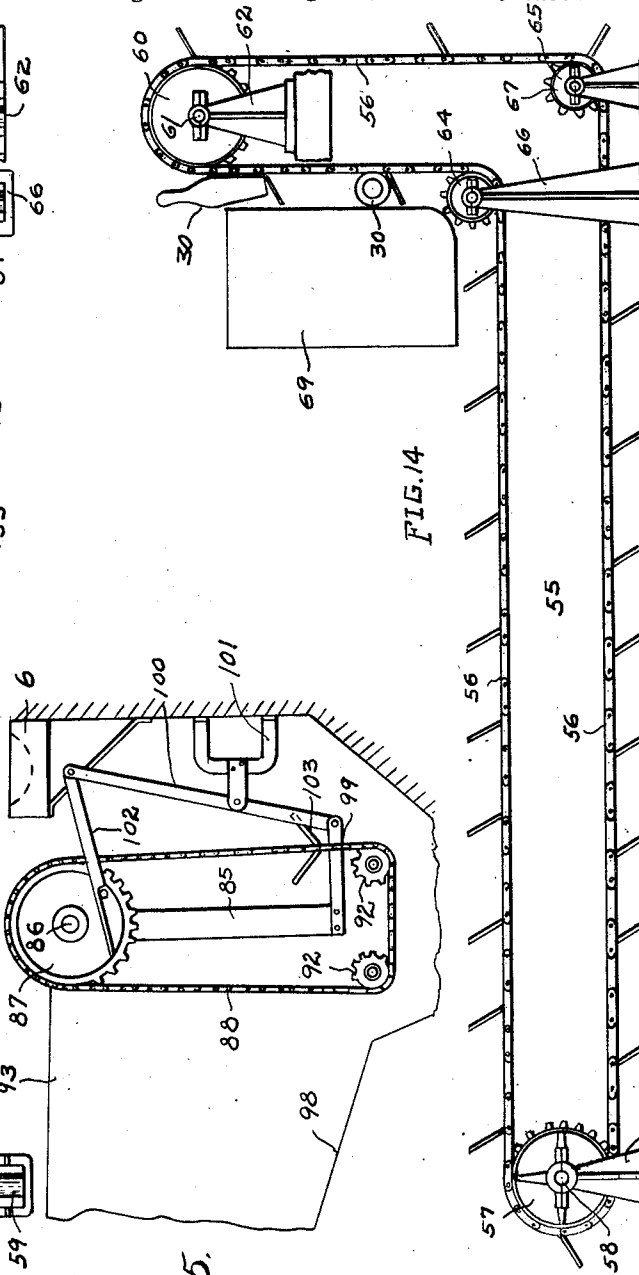


FIG. 14

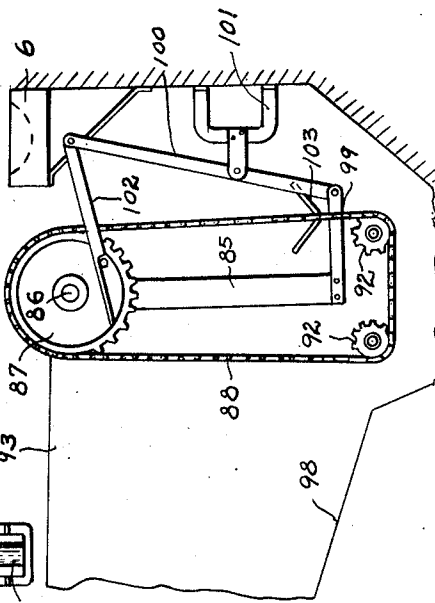


FIG. 15

INVENTOR.
Walter H. Gray,
BY Walter N. Haskell.
his ATTORNEY

UNITED STATES PATENT OFFICE.

WALTER H. GRAY, OF DAVENPORT, IOWA.

BOWLING-ALLEY SYSTEM.

Application filed August 12, 1921, Serial No. 491,680. Renewed November 5, 1924.

To all whom it may concern:

Be it known that I, WALTER H. GRAY, a subject of Great Britain, residing at Davenport, in the county of Scott and State of Iowa, have invented certain new and useful Improvements in a Bowling-Alley System, of which the following is a specification.

My invention relates to bowling alley systems, and aims to provide a mechanism whereby the work of removing the pins from the alleys and re-setting the same, and the return of the balls to the point from which they have been rolled, can be accomplished almost entirely by such mechanism.

When it is desired to roll a game, or series of games, difficulty is often encountered in securing a pin setter, or if one is secured, he proves to be incompetent, and the pins are not satisfactorily spotted. The work of removing the pins which have been knocked down is also accompanied by considerable risk to the limbs of the pin-setter. On account of these and other objectionable features connected with the removal and replacement of pins, the playing of the game is frequently far from satisfactory.

One of the purposes of the present invention is to do away with the work of removing and re-setting the pins by hand, by the substitution of mechanical means whereby a series of alleys can be cleared of the pins at the proper times, and such pins collected at a common point for re-distribution to the several alleys.

Another object of the invention is to provide a means for distributing the pins to the different alleys, and placing them in position thereon, each one on its proper spot.

An additional object of the invention is to provide mechanism, in conjunction with the foregoing means, for automatically returning the balls to the point from which they have been delivered, ready to be used again.

The particular arrangement, and operation of the various parts of the invention, as set forth herein in its preferred embodiment, will be more fully understood from the following specification, reference being had to the drawings accompanying the same, in which:

Fig. 1 is a plan view of a series of alleys equipped with my invention.

Fig. 2 is a front elevation of the pin-setting devices, with the mechanism in rear thereof removed.

Fig. 3 is an end view of the pin-setter devices, with one side of one of the partitions 5 removed.

Fig. 4 is a plan view of one of the pin-setter operating devices.

Fig. 5 is a plan view of the pin distributing mechanism.

Fig. 6 is an end projection thereof.

Fig. 7 is a detail of one of the pin compartments of the pin-setting frame 19, in plan view.

Fig. 8 shows the same in side elevation.

Fig. 9 is a side elevation of the gearing for operating the alley cleaning mechanism.

Fig. 10 is a plan view thereof.

Fig. 11 is an edge view of the sprocket-wheel 73 and appurtenant flange-wheels, detached.

Fig. 12 shows a portion of the sprocket-chain 72.

Fig. 13 is a plan view of the pin distributing mechanism.

Fig. 14 is a side elevation thereof.

Fig. 15 is an end view of the ball return mechanism.

Similar reference characters are employed to indicate corresponding parts throughout the several figures.

In Fig. 1 is shown a series of alleys, which are shown considerably shortened in proportion to their width. In said figure the numeral 1 indicates the main floor, and 2, 3, and 4 the alleys thereof, separated at their rear ends by partitions 5. In rear of the alleys is a trough 6 into which the balls are delivered, after being rolled, in the manner hereinafter set forth. The trough 6 is curved at one end into a return run-way 7, along which the balls roll in the usual manner by force of gravity, until they are returned to the point at which they were delivered.

9 represents the ceiling of the bowling alley room, to which are fixed supports 10 and 10^a, to the lower ends of which are secured frames 11, supporting bearings 12, in which are journaled shafts 13. Each of the alleys is provided with mechanism of the kind just described, which relates chiefly to the pin-setting devices, so that a reference to any of such mechanism or the parts thereof, will be understood to apply to either of said alleys. In Fig. 3 the shaft 13 is shown fitted with a sprocket wheel 14, and in rear thereof is a similar wheel 15, fixed

on a shaft 16, journaled on the frames 11. Passing over the wheels 14 and 15 is a sprocket-chain 17, the forward end of which is connected with a rod 18, forming a support for the front end of a triangular frame 19. Journaled on the frames 10, between the shafts 13 and 16, is a shaft 20, on which is a sprocket-wheel 21, over which the chain 17 passes. The shaft 20 is operated by means of a sprocket-chain 22, driven by a sprocket-wheel 23 on a shaft 24, journaled in the lower ends of supports 25 depending from the frames 11. The chain passes over a similar sprocket wheel 22^a on the shaft 20. A sprocket-chain 26 passes over sprocket-wheels 26^a and 26^b on the shafts 20 and 16, respectively, and is connected at its front end with a rod 27, attached to the rear end of the frame 19. To the rear end of the chain 17 is fixed a weight 28.

When the shaft 20 is suitably rotated it operates to move the chains 17 and 26 forwardly, letting the frame 19 downwardly into a position in proximity to the floor. When this operation is being carried out the frame is supplied with a set of the pins, which are held and released in the manner hereinafter set forth. Upon the frame being emptied of the pins the frame is returned to an elevated position by means of the weight 28. At two opposite points in the chain 22 the connecting bars of the links are omitted, as shown in the chain 72 in Fig. 12, and as these portions pass around the wheels 23 and 22^a such chain fails to engage with the teeth on such wheels and the movement of the chain is interrupted. This also permits the wheel 22^a to rotate rearwardly, upon the return movement of the chains 17 and 26.

The frame 19 is divided by partitions 29 into triangular compartments, each of which is designed to hold one of the pins 30, in such a position that the pins will be exactly spotted when released from the frame. Vertically movable in the partitions 29 are rods 31, secured at their upper ends to a frame 32, conforming in shape to that of the frame 19. The rods 31 are provided with coupling blocks 33, connected with which are the short ends of bell-crank levers 34, fulcrumed in bearings 35 on the lower faces of plates 19^a, forming floors for the compartments, and provided at a central point with openings 19^b, just large enough to permit the passage of the pins 30. These openings are so positioned with relation to the frame that the pins will be in exact position for spotting when held in place therein. The inner ends of the arms 34 engage the lower inclined faces of the pins, and hold them in place until they reach a point just above the floor of the alley. The ends of the rods 31 project downwardly a little distance beyond the lower ends of

the pins 30, and when such rods come in contact with the floor they are forced upwardly, moving the arms 34 outwardly, and permitting the pins to rest on the floor. The frame 32 is provided in front and rear with a projection 36, which passes a lug 37 on the rods 18 and 27 as the frame 19 continues to move downwardly, upon which such projection and lug are locked from return movement by means of a trip-lever 38, the upper end of which enters the space between the projection and lug. The trip-lever is actuated by means of a pin 39, pivoted thereto; which comes in contact with the floor when the frame 19 has nearly completed its downward movement. At the end of the upward movement of the frame 19 the trip-lever 38 encounters the end of a rod 40, projecting downwardly from the frame 11, releasing the projection 36 and permitting the frame 32 to move downwardly to its normal position.

At each side of the alleys are supports 41, (Fig. 3) supporting a pair of tracks 42, on which operate rollers 43 on brackets 44, fixed to a board 45, having a movable bottom 46. The board 45 has a plurality of openings 47, of sufficient size to permit the passage of one of the pins 30, and the bottom 46 has a similar group of openings 48, normally out of register with the openings 47, so as to interfere with the passage of the pins. The bottom 46 is held yieldably in place by means of a spring 49, fixed to the board 45 and bearing against the edge of said bottom piece.

Extending transversely of the alleys between the supports 41 is a cross-bar 50, to which are pivoted pairs of dogs 51 and 52, one pair for each alley. Each pair of dogs is provided with an operator's rod 53, to one end of which is secured a hand-lever 54, pivoted to one of the supports. The dogs are normally in a reclining position, but when it is desired to set the pins in either alley, the dogs pertaining thereto are partially raised by an operator, by means of the lever 54. The carrier 45 is then given a shove in the direction of such dogs, passing over the dog 52, which is shorter than the dog 51, and coming in contact with the latter dog. This operates to move the bottom 46, bringing the openings 47 and 48 into register, and permitting the pins which are in the carrier to pass downwardly into the frame 19 which is immediately beneath the same. The impact of the bottom 46 against the dog 51 raises such dog into a vertical position, also elevating the dog 52 just in rear of the bottom 46, preventing any rebound of the carrier when it strikes the dog 51. To return the carrier to the starting point the lever 54 is operated to force the dog 51 against such carrier, the dog 52 turning downwardly beneath the same.

It will be evident that it will not be necessary to provide a pair of the dogs for the alley next to the operator, as the carrier will be in a convenient position for him to operate the movable bottom by hand.

In order that the pins may be distributed by an operator at one side of the alleys it is necessary that such pins be collected at a convenient point, and this is accomplished by means of an endless carrier 55, (Figs. 14 and 15,) at the sides of which are sprocket-chains 56, having horizontal movement in the trough at the rear end of the alleys, passing at one end round sprocket wheels 57 on a shaft 58 journaled on supports 59, and passing upwardly at the other end round wheels 60 on a shaft 61, journaled in supports 62, mounted on the main frame. The chains 56 also pass round idler sprocket-wheels 64 and 65 supported on shafts mounted on supports 66 and 67. The carrier 55 is provided at regular intervals with transverse blades 68, which engage the pins 30, carrying them to one side of the alleys, and then upwardly between the carrier and one wall of a receptacle 69, supported adjacent to the carrier, and in a position convenient to the operator, for filling the carrier 45. The blades 68 are inclined so that as they come to the upper end of the receptacle the pins will fall therein by the force of gravity. From the receptacle the pins are placed in the carrier 45, the loading thereof being facilitated by funnel-shaped guides 70 with which the openings 47 are provided.

After two balls have been rolled at the pins in the usual manner the pins which remain at the end of the alley are swept therefrom, in the direction of the carrier 55, by the following means, as more particularly shown in Figs. 3, and 10 to 13 of the drawings. Near the rear upper corner of each of the partitions 5 is journaled a shaft 71, driven by a sprocket-chain 72, passing round sprocket-wheels 73 and 74 on the shafts 24 and 71, respectively. At one point in the chain 72 a number of the cross-bars are omitted, as indicated in Fig. 12, so that when that portion of the chain passes round the wheel 73, there will be no engagement of the teeth of the wheel thereby, and the movement of the chain 72 will be interrupted. As a result the wheel 74 and shaft 71 will be stationary. To prevent the chain from slipping from the wheel 73 when the broken links encounter the same, such wheel is provided on each side with a flanged wheel 75.

Fixed on the shaft 71, adjacent to the wheel 74, is a sprocket-wheel 77, over which passes a sprocket-chain 78, such chain passing round similar sprocket-wheels 79 rotatably mounted in the other corners of the partition 5. The chains 78 are arranged in

pairs on opposite sides of the partitions, and the alley between each pair of chains is spanned by a sweeper-bar 80, secured at its ends to such chains. Each movement of the chain 72 operates to impart a complete movement to the bar 80, first downwardly near the forward ends of the partitions, and then rearwardly on a line a little above the floor of the alley, so as to sweep all of the pins from the alley into the trough in rear thereof.

The chain 78 is given an initial movement by means of a dog 81, pivoted to the frame, and fitted with an operator's rod 82, which may extend to the front of the alleys, and be actuated from that point. The movement of the chain 78 rotates the shaft 71 sufficiently to cause one of the teeth in the wheel 74 to engage the chain 72, and impart movement thereto. This movement continues until the broken part of the chain again engages the wheel 73, resulting in a stoppage of the chains 72 and 78. When this occurs the bar 80 has been returned to its normal position, near the forward ends of the partitions. To prevent the chain from leaving the wheel 74, when the broken part of the chain comes into engagement therewith, such wheel is formed with a greater diameter than that of the wheel 73.

As the chain 72 nears the end of its movement a projection 83 thereon comes in contact with a similar projection 84 on the chain 22, moving such chain into engagement with the wheel 23, and setting the pin-setter devices into operation. By this means the lowering of the pin-setting frame in any alley will follow immediately after such alley has been cleaned of pins.

In rear of each alley is a back-stop 85, swingingly mounted on a shaft 86, on the ends of which are fixed sprocket-wheels 87, over which pass sprocket-chains 88, such chains passing downwardly round idler-wheels 92 rotatably mounted on rearward extensions 93 of the partitions 5. The shaft 86 is driven by means of a chain 94, (Fig. 9) connecting sprocket-wheels 95 and 96 on the shafts 86 and 24 respectively.

As one of the balls 97 leaves the alley it rolls down an incline 98 and strikes the lower end of the back-stop 85, causing the same to move rearwardly. Fixed to the lower end of the back-stop is an arm 99, connected with the lower end of a lever 100, fulcrumed in a frame 101. Pivoted to the upper end of the lever 100 is an arm 102 in engagement with a lug on the side of the wheel 87. A portion of the bars of the chains 88 are omitted, at one point therein, as hereinbefore described, so that said chains are normally at rest, but the rearward movement of the back-stop, operating through the lever 100 and arm 102, gives to the wheel 87 an initial movement, which is

continuous until the broken links again encounter the wheel. The chains 88 are united by a trough-shaped receptacle 103, which moves downwardly and forwardly when the chains are in motion, picking up the ball 97 and carrying it upward and over the top of the back-stop, where the ball is dumped into the trough 6, from which it is returned to the front of the alleys, in the manner before described.

The receptacle 69 can be provided with an extra supply of pins, so that the operator who is filling the pin-carrying frame will not need to wait each time until the pins are returned from the alley which is to be filled next.

While the device has been shown in its application to three adjacent alleys, it will be evident that a greater number of such alleys can be operated in a series, if desired.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. In a device of the class described, the combination with a series of alleys and partitions at the rear ends thereof, pin-setting frames supported so as to be vertically movable over the rear ends of said alleys; pin retaining means carried by said frames, adapted to hold a set of pins in position for being set in their proper places on the alley; means for releasing said pins upon the pin-setting frame approaching to within a desired distance from the floor; and a pin delivering mechanism, movable transversely of the alleys, and capable of delivering a set of pins to one or other of the pin-setting frames, at will.

2. In a device of the class described, in combination with a series of alleys and partitions at the rear ends thereof, pin-setting frames vertically movable over the rear ends of said alleys, provided with pin-retaining devices; means for operating either of said frames independently of the others; means for releasing said pins upon the same coming in contact with the floor; a pin-carrying frame movable transversely of said pin-setting frames, at a point above the same; means for holding a set of pins in said carrying frame, in position for delivery thereof to one of said pin-setting frames, in proper position for being spotted on one of the alleys; and means for releasing said pins when in position for delivery to one of said pin-setting frames.

3. In a device of the class described, in combination with two or more alleys and partitions at the rear ends thereof, pin-setting frames supported so as to be vertically movable over the rear ends of said alleys; pin retaining means carried by said frames, adapted to hold a set of pins in position for being set on their proper spots on the alleys; means for releasing said pins upon the pin-setting frame approaching to a

point near the floor; a pin delivering mechanism, capable of delivering a set of pins to one or other of the pin-setting frames, as desired; and mechanism for cleaning the remaining pins from the alley after the desired number of balls has been rolled.

4. In a device of the class described, in combination with a series of alleys, pin-setting frames supported above the rear ends of such alleys so as to be movable vertically with relation thereto; pin-retaining devices supported in said frames, capable of holding a set of pins in position for being delivered to the alley, in their proper positions; a pin carrier adapted to receive a set of pins and hold them in position for delivery to a pin-setting frame, and capable of movement transversely of said frames; means for interrupting the movement of said carrier at a point above one or other of the pin-setting frames, as desired; means for the delivery of pins from said carrier to said pin-setting frame coincidently with the stoppage of the carrier; and means for returning said carrier to its starting point.

5. In a device of the class described, a pin-setting frame provided at opposite sides with supporting rods; chains connected with said rods and operating wheels therefor; a drive-chain operatively connected with said wheels, and provided at opposite points with blank spaces; a pair of wheels over which said chain passes, being inoperative when the blank spaces are in engagement with said wheels; the movement of said chains operating to lower the pin-setting frame; and means for returning said frame to an elevated position.

6. In a device of the class described, a pin-setting frame mounted so as to be capable of vertical movement above the rear end of a bowling alley; bell-crank levers fulcrumed to the lower part of said frame, adapted to engage the lower ends of a set of ten pins; rods operatively connected with said levers and vertically movable in said frame; an auxiliary frame uniting the upper ends of said rods; and means for locking said auxiliary frame in spaced-apart relation with the main frame during the upward movement thereof.

7. In a device of the class described, in combination with a series of alleys and partitions separating the same at the rear ends thereof, pin-setting frames vertically movable over the rear ends of said alleys, provided with means for delivering a set of pins thereto, in proper position; a pin-carrying apparatus movable transversely of the pin-setting frames, and capable of delivering a set of pins to one or other of said frames, as desired; sweeper mechanisms supported between said partitions, capable of removing the residuary pins from the alley; means for operating said mechanisms inde-

pends of each other; and conveyor devices in rear of the alleys, adapted to receive the pins and convey them to a point at one side of the alleys.

- 5 8. In a device of the class described, in combination with a series of alleys and partitions separating the same at the rear ends thereof, pin-setting frames vertically movable over the rear ends of said alleys, provided with means for delivering a set of pins thereto, in proper position; a pin-carrying apparatus movable transversely of the pin-setting frames and capable of delivering a set of ten-pins to one or other of said frames, as desired; sweeper mechanisms supported between said partitions, capable of removing the residuary pins from the alleys; a pin receptacle at one side of the alleys, convenient to said pin-carrying apparatus; and conveyor devices in rear of said alleys, adapted to receive the pins from said alleys, and deliver them to said receptacle.
- 10 15 20

9. In a device of the class described, in

combination with a series of alleys and partitions at the rear ends thereof, sweeper devices supported between said partitions, so as to be normally out of the way of the pins on said alleys; means for actuating said devices, to remove the residuary pins from the alleys at the rear ends thereof; and conveying mechanism in rear of said alleys, capable of receiving said pins and delivering the same at one side of the alleys.

25 30

10. In a device of the class described, in combination with a ten-pin alley, a back-stop swingingly mounted in rear thereof; ball elevating devices in proximity to said back-stop, and normally inactive; and mechanism operatively connecting said back-stop with said elevating devices, adapted to set the same in motion upon the back-stop receiving the impact of a rolled ball, to cause said devices to elevate such ball to a point for return to the point from which it was rolled.
- 35 40 45

In testimony whereof I affix my signature.

WALTER H. GRAY.